

Title: Non-invasive Corrosion Sensor

Application Number: 10/744,649  
Response to Office Action mailed 12/15/2004  
Navy Case Number 85003**Listing of Claims**

1. (Amended) A non-invasive corrosion sensor, the sensor able to detect corrosion on a test piece, the non-invasive corrosion sensor comprising:
  - a. a heat sink;
  - b. a peltier, the peltier having a first side and a second side, the peltier communicating with the heat sink such that the first side of the peltier is maintained at a common temperature a reference peltier and a test piece peltier, each peltier having a positive side and a negative side, each peltier communicating with the heat sink such that the negative side of each peltier is maintained at a common temperature;
  - c. a reference standard, the reference standard and the test piece communicating with the second side of the peltier the reference standard communicating with the positive side of the reference peltier, the test piece communicating with the positive side of the test piece peltier; and
  - d. a data acquisition device device, the data acquisition device device able to record and compare the differences in temperatures of the test piece and the reference standard, whereby a higher temperature in the test piece than in the reference standard indicates the presence of corrosion, the differences in temperatures of the test piece and the reference standard obtained via electrical currents in the reference peltier and the test piece peltier.
2. (canceled)

Title: Non-invasive Corrosion Sensor

Application Number: 10/744,649  
Response to Office Action mailed 12/15/2004  
Navy Case Number 85003

3. (canceled)

4. (canceled)

5. (Amended) A non-invasive corrosion sensor, the sensor able to detect corrosion on a test piece, the non-invasive corrosion sensor comprising:

- a. a heat sink;
- b. a reference peltier and a test piece peltier, each peltier having a positive side and a negative side, each peltier communicating with the heat sink such that the negative side of each peltier is maintained at a common temperature;
- c. a reference standard, the reference standard communicating with the positive side of the reference peltier, the test piece communicating with the positive side of the test piece peltier;
- a. a data acquisition device devise, the data acquisition device devise able to record and compare the differences in temperatures of the test piece and the reference standard, whereby a higher temperature in the test piece than in the reference standard indicates the presence of corrosion, the differences in temperatures of the test piece and the reference standard obtained via electrical currents in the reference peltier and the test piece peltier; and
- d. an enclosure, wherein the heat sink, the reference peltier, and the reference standard are disposed within the enclosure.

Title: Non-invasive Corrosion Sensor

Application Number: 10/744,649  
Response to Office Action mailed 12/15/2004  
Navy Case Number 85003

6. (original) The non-invasive corrosion sensor of claim 5, wherein the enclosure is manufactured from polycarbonate and environmentally sealed with flowable RTV silicone coating.

7. (original) The non-invasive corrosion sensor of claim 6, wherein the test piece and the reference standard are manufactured from the same material.

8. (original) The non-invasive corrosion sensor of claim 7, wherein the heat sink is manufactured from aluminum.

9. (original) The non-invasive corrosion sensor of claim 8, wherein the reference standard is polished to remove all surface corrosion and contaminants and is sealed.

10. (original) The non-invasive corrosion sensor of claim 9, wherein each negative side of each peltier is bonded to the heat sink with thermal epoxy.

11. (original) The non-invasive corrosion sensor of claim 10, wherein the thermal epoxy is a Zinc-Oxide/Silicon based grease.

12. (original) The non-invasive corrosion sensor of claim 11, wherein the thermal grease is about 60 to about 80% zinc oxide with dimethyl polysiloxane, silicone fluid and polymethylsiloxane.

13. (original) The non-invasive corrosion sensor of claim 12, wherein the thermal grease

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Navy Case Number 85003

has a specific gravity of about 2.2, its solubility in water is negligible and has a flashpoint above 250 degrees Fahrenheit.

14. (canceled)

15. (original) The non-invasive corrosion sensor of claim 13, wherein the positive side of the reference peltier is bonded to the reference standard with thermal interface material.

16. (canceled)

17. (canceled)